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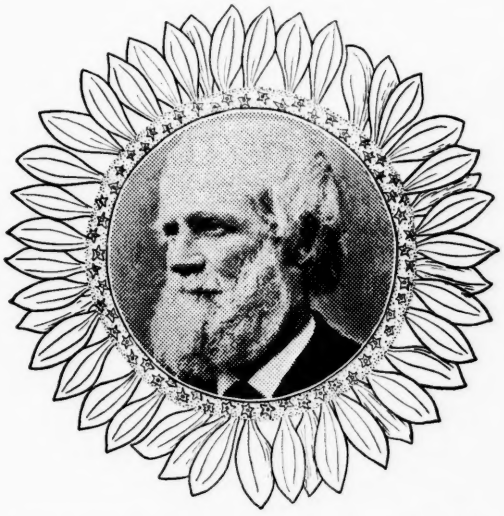

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VOLCK SPECIAL EMULSION NUMBER 2 AS A CONTROL FOR EXTERNAL PARASITES OF ANIMALS (1)

By

HORACE L. CALER,

Kansas State College of Agriculture & Applied Science

INTRODUCTION

The experimental data herein recorded were obtained from studies made at Kansas State College, Manhattan, Kansas, under a fellowship provided by the California Spray Chemical Corporation in cooperation with the Crop Protection Institute. The studies were begun June, 1927, by Wesley G. Bruce and continued in succeeding years by David G. Hall (1928), Harry Skoog (1929), and, beginning June, 1930, by Horace L. Caler, This paper is a summary of the four years' work which is expected to close this investigation (2).

DESCRIPTION OF MATERIAL

The material dealt with in this paper, Volck Special Emulsion Number 2, is an emulsion of white oil. The emulsifier has been changed from that of other Volck products in order to reduce any possible irritation. It has the consistency of thick cream and is nearly pure white in color. Volck mixes readily with both hard and soft water. Further reference to "Volck" means "Volck, Special Emulsion Number 2". In carrying out these experiments, the comparative cost of other materials has not been considered.

(1) Contribution No. 391 from the Department of Entomology.

(2) The work has been directed by a committee composed of Dr. Roger C. Smith, Chairman; Professor Geo. A. Dean, Dr. E. J. Frick, Dr. F. C. Bishopp and Prof. W. C. O'Kane. Prof. D. A. Wilbur and others of the staff of the Department of Entomology at Kansas State College gave some time and valuable advice during the course of the work. Dr. H. W. Brubaker and Prof. W. L. Latshaw of the Department of Chemistry, Kansas State College, have been consulted concerning chemical aspects of this work. The cooperation of all the departments concerned has materially assisted in carrying on the experimental work.

EXPERIMENTAL DATA

EFFECT OF VOLCK ON ANIMALS

When Applied Externally:

Volck apparently causes little or no irritation to the skin of animals or birds. On some animals, especially cats and dogs, it causes an accumulation of dust and dirt if the excess oil is not removed.

Cattle were often sprayed on hot days and exposed to the sun while dripping wet with Volck, but in no instance has any apparent ill effects been noticed. All the workers have noticed that the effects of Volck on the hair and skin of animals is desirable except in the case of dogs and cats and, if those animals are given a soap and water bath, the desirable effects are obtained. Volck leaves the hair in a fine, soft, and fluffy condition and improves the skin texture.

When Taken Internally:

Skoog, Hall and Caler gave dogs and hogs varying amounts (one-half ounce to 12 ounces) of 100% Volck. Except with the 12 ounce dose, no ill effect were observed subsequent to treatment or upon post mortem other than might have been caused by some irritating substance in the food. With the 12 ounce dose a severe gastritis was found. Hall (2) states that the animal would have been able to throw off these ill effects. Since Volck is so safe to use, causing no harm to the animals either externally or internally, it is particularly promising as a treatment for external parasites on valuable animals.

EXTERNAL PARASITES OF CHICKENS

Biting Lice

(Goniocotes abdominalis Piaget), **(Menopon biseriatum** Piaget) and **(Menopon pallidum** Nitzsch).

Preliminary tests by Bruce (1) with groups of three to four birds showed that lice on hens were killed by immersing the birds in a 7% emulsion of Volck in water, the emulsion being at 100 degrees—102 degrees F. Especial attention was given to the effect upon the birds. Although usually no harmful effects were noticed, in a few cases chickens died after this treatment. However, it is not definitely known that Volck was the cause of death.

One hundred seventy-five birds were dipped in a 7% solution of Volck at 104 degrees F. They were dip-

ped in less than two hours by two workers. The lice were dead in about one hour. The birds were examined at one week intervals. Bruce states that no lice were found until the tenth week. There were 25 untreated cockerels from which the new infestation could have come.

There were no harmful effects to the treated birds other than noted above. The feathers were somewhat ruffled for about two weeks and the white feathered birds had a creamy color which disappeared after three weeks. Egg laying was not affected by the treatment and very good egg production was reported during the following winter.

Four hens were dipped in a 6% emulsion of Volck at 102 degrees F., and four days later no live lice were found.

Mites

The Common Chicken Mite

(**Dermanyssus gallinae** Redi)

An experiment was carried out primarily to see whether one might not use remaining Volck solutions following treatment of domestic animals to rid chicken houses of mites. Infested poultry houses were sprayed with Volck solutions. All roosts were loosened and trash removed. A 60% emulsion was used in the first test, but a 50% emulsion was used in later tests, as it gave a better spray. The Volck was applied with a compressed air sprayer, using a specially devised spray disc which afforded less waste and gave greater force. Bruce found that a 50% emulsion gave a 100% control.

The Northern Fowl Mite

(**Liponyssus sylviarum** C. & F.)

Two birds, heavily infested with **Liponyssus sylviarum,** or mites, were dipped in an 8% solution which was not warmed. One day later Bruce estimated a kill of 80%. Two days after treatment, about 1% of mites were alive. Thereafter for twelve days no live mites could be found and at the end of this time the birds appeared improved, physically.

Hall dipped four birds, infested with **L. sylviarum,** in solutions of 5% and 10% Volck. The following day no live mites were found.

EXTERNAL PARASITES OF CATS AND DOGS

Fleas (**Ctenocephalis** spp.)

In treating cats and dogs for fleas, Bruce dipped the smaller animals and sprayed the larger ones. Hall and Skoog dipped the animals with which they worked. Caler dipped the smaller animals and gave the larger ones a sponge bath in the emulsion.

Bruce started with a 5% solution, which gave approximately a 10% control. He gradually increased the strength of the solution to 10%, at which concentration a 100% control was secured if the Volck was thoroughly applied and the treated animals kept in flea-free quarters. Bruce states that cats and dogs treated with a solution of Volck appeared in much better condition in that the hair was soft and glossy, particularly after being washed.

Hall started with a 4% solution of Volck. This gave but a very incomplete kill of the fleas. A 5% solution was used which he says resulted in a fair control. He also used a 6% solution, but 24 hours after application one treated animal had two live fleas and another had four live fleas. No fleas were found on a cat treated with a 6% solution until three days after treatment. Hall stated that there was apparently no repellent effects.

Skoog found that the hair of cats and dogs was matted after a treatment with Volck. He did not find a successful method of removing the excess oil.

Caler treated five heavily infested cats with an 8% solution of Volck at 90 degrees F. He observed that the fleas were not quickly killed by the Volck. As soon as the solution penetrated the fur, the fleas came to the outside and moved about on the surface, many going to the head of the animal. It was 30 minutes before any appreciable number of fleas were killed. Many did not succumb until one hour after the cats had been dipped. Two hours after dipping, a few live fleas were found on the animals. The cats were kept out of doors.

Five days later the cats were found to have a few fleas, so they were dipped again, this time in a 10% solution of Volck. They were held in the solution for three minutes and the heads immersed several times. Two days later they were examined and no fleas found. They were also examined at intervals of 2-3 weeks for four months, and at no time could any fleas be found on them.

It was found advisable to give the animals a soap and water bath the day after dipping to remove the excess oil. If not bathed in soap and water, the exceedingly oily fur soon became matted, collected much dirt, and made the animal very filthy. But the soap and water bath left the fur very soft and fluffy.

Later more dogs and cats were treated and in all cases, except two, 100% control was obtained with a 10% solution of Volck. The two cases where 100% control was not secured were animals which had never been bathed and had very thick, dirty, matted hair, preventing full penetration of the Volck solution.

Several dogs were observed to lap up some of the solution, and one bulldog, apparently liking the oil, consumed at least 50 cc. of the 10% solution. Neither this animal nor any of the others showed any ill effects from the Volck. The Volck was applied so freely that the solution entered the eyes, ears and mouth of the animals, but it was not harmful.

Toxicity of Volck Special Emulsion No. 2 to Fleas.

Caler collected live fleas from infested cats and carried out experiments to determine the length of time necessary for various concentrations of Volck to kill the fleas. Concentrations of Volck ranging from 4% to 20% were made up. The fleas were dipped under for 15 seconds. They were then removed and placed in clean vials and the length of time necessary to kill them observed. The "time to kill" in the following table was calculated as the average for the four fleas, except for concentration 5, which was calculated for the average of the three that died. The results are shown in Table I.

TABLE I

Length of Time to Kill Fleas

Concentration	Time dipped	Time dead	Hours	Minutes	Number revived
4%	5:37	8:12	2	35	0
5%	5:41	8:07	2	26	1
6%	5:44	7:47	2	3	0
7%	5:49	7:74	1	35	0
8%	5:54	7:15	1	21	0
9%	6:19	7:27	1	8	0
10%	6:25	7:48	1	23	0
12%	6:35	7:30		55	0

15%	6:38	7:36		58	0
20%	6:47	7:54	1	12	0
Check			81	26	0

This experiment was repeated later and much the same results obtained.

In both experiments, the fleas were examined individually under the high power of a binocular microscope to determine when they were dead. They were rendered inactive and apparently dead in about 20-30 minutes after dipping, but were not recorded as dead until after the lapse of one or two hours.

Lice

Biting Louse of Dogs
(**Trichodectes canis** DeGeer)

Hall treated two dogs that were infested with the biting dog louse with 5% and 7% Volck solutions. He found that both dilutions gave a satisfactory control of nymphal and adult lice, but both animals later became reinfested. One was redipped in a 5% solution of Volck and control of the lice was obtained.

Some of the dogs which Caler treated for fleas also had lice. A 100% control was secured on all of these with a 10% solution of Volck.

Mange Mites

Head Mange Mite of Cats
(**Notoedres cati** Hering)

Skoog treated two cats, infected with mange, with six daily applications of a 50% solution of Volck. There was a noticeable improvement for a short time. Later, one cat died (from a spraying operation) and at the end of a month a renewed infestation of mange mites occurred on the other cat. Skoog believed that the new infestation was due to a renewed activity of mites present before the treatment.

An alcoholic solution of Volck was made up (50 cc. of 70% denatured alcohol and 30 cc. of Volck). The cat was treated with this on two consecutive days, followed by a two-day interval before the next treatment. This was repeated three times, or a total of six treatments, with two-day intervals between each two treatments. Skoog estimated that this gave a 75% control at the very best. The animal died four days after the last treatment. Examinations of skin scrapings showed that fully 90% of the live mites seen had been at least touch-

ed by the Volck. Live mites were placed in the alcoholic solution described above and also in a 50% aqueous solution and observed by Skoog under a binocular microscope. The mites in both solutions lived for more than thirty minutes.

The Dog Follicle Mite

(**Demodex canis** Leydig)

A dog heavily infested with mange was secured by Hall and given four treatments of 25% Volck, the first two, seven days apart, and the last two, three days apart. These four treatments were followed by four applications of 100% Volck, the applications being three days apart. The Volck was applied at approximately body temperature.

Before each application the dog was thoroughly washed with warm water and soap, scabs removed, the pustules opened, and contents removed.

Hall states that there was a slight improvement at first, but after the third day no improvements were noticed.

A mixture of one-fourth pound of Derris powder to one gallon of 90% Volck was rubbed over the entire body of the dog. This did not give satisfactory results and Hall stated that it was apparently toxic to the dog. The dog had open sores which would permit the Derris to get into the system.

EXTERNAL PARASITES OF HOGS

Sucking Lice

The Hog Louse (**Haematopinus suis** L.)

Bruce used an 8% solution of Volck on 38 hogs infested with lice. It was applied with a compressed air sprayer, the material being rubbed into and around the ears and into the folds of the neck. A kill of about 95% was estimated one week later.

Hall experimented with a herd of 220 shoats and hogs. The herd was divided into four lots and either dipped or sprayed with Volck solutions of 4%-12% concentrations. The 4% and 5% solutions, applied as dips, were found to have a little effect on the lice. The 7% 9% and 12% solutions gave 100% control on animals which were dipped into the solutions. Seven days later it was observed that the hogs were becoming reinfested but this may have been from contact and not from eggs.

Forty-nine pigs were dipped in a 6% solution. This proved to be 100% effective, the same as the 7%, 9%

and 12% solutions had been.

Fifteen days after the first treatment, all the previously treated pigs were again dipped or sprayed. Three days after treatment, 47 small pigs died. Post-mortem examinations by the Clinic Department of the Veterinary College showed cholera lesions and pneumonic symptoms.

Fifty-five hogs were sprayed by Hall with Volck in dilutions ranging from 5% to 12%. Unsatisfactory control of lice was secured, apparently because of the protection afforded the lice in the ears and in folds, such as about the legs.

Six months after treatment (April 15) the herd was inspected and a few lice found, as, for example, seven lice on one animal, two on another, and none on nine. It was believed by Hall that the reinfestation came from several animals which had been sprayed only once.

Skoog carried out a carefully controlled experiment to determine the effect of Volck on all stages of the hog louse. Three pigs were used. Previous to dipping, an average of 90 louse eggs were taken from each of two pigs, placed in large glass vials and kept in an incubator at 37.5 degrees C. The three pigs were dipped in a 10% solution of Volck at 80 degrees F. The treated animals were kept in quarters never before occupied by hogs. On the second day after treatment, 100 louse eggs were taken from each of the pigs and placed under the same conditions as those removed previous to dipping. Similar numbers of louse eggs were secured from each of the pigs 16 days after dipping. This number was found with difficulty because of disintegration of the eggs.

No adult or nymphal lice were found on the animals 21 days after treatment. The viability of the eggs taken previous to treatment was 90%. The viability of those taken from treated animals was zero. This experiment gave a 100% kill of eggs, nymphs, and adults in a 10% solution of Volck at 80 degrees F.

Caler treated a herd of 12 hogs using a 10% solution of Volck as a spray. An apparent 100% kill of eggs, nymphs, and adults was obtained, as none of these were found on several examinations during the next 25 days after treatment.

Mange

Mange Mite of Hogs

(**Sarcoptes suis** Gerlach)

Skoog immersed mange mites in a 50% solution of Volck and observed them under a binocular microscope. None was killed in less than a full hour. He stated that it appeared that the mites died from an exhausting struggle to get out of the oil rather than from any specific toxic effect.

An attempt was made by Skoog to add flowers of sulfur to the Volck emulsion, but it would not stay in suspension.

He then made up a 10% solution of Volck, using water to which 40% nicotine sulphate ("Black Leaf 40") had been added at the rate of one fluid dram of nicotine sulphate (40%) to each gallon of water. Mange mites immersed in this preparation invariably died within five minutes.

As these preliminary tests gave promise of success, two pigs were dipped in the preparation described above, care being taken that none of the dip was swallowed by the animals. Skoog stated that no toxic effects upon the pigs could be observed following the dipping.

Skin scrapings on the fourth and ninth days following treatment showed presence of the oil but no mites, either dead or alive. Skin scrapings at three-day intervals for three weeks thereafter revealed no mites. Skoog stated that the pigs steadily improved in health and weight.

Hall divided a herd of 68 pigs infested with mange mites into three experimental lots. Lot No. 1 was dipped in a 5% solution; lot No. 2 in a 10% solution, and lot No. 3 in a 20% solution of Volck. He found that dilutions up to 20% gave no control of mange on hogs in a single application.

EXTERNAL PARASITES OF CATTLE

Ox-Warble

(**Hypoderma lineata** Villus)

Bruce treated 69 warbles on cattle with a 50% solution of Volck, injecting the oil into the cysts by means of a small oil can. After six or seven days the warbles were extracted and the mortality recorded. The warbles were shocked by means of a dry battery and resistance coil to determine if they were alive. It was found that 50%

Volck had little or no effect on the warbles. Of the 69 treated, only seven were found dead.

Sucking and Biting Lice of Cattle (**Linognathus vituli** Linn.), (**Haematopinus eurysternus** Nitzsch) and (**Bovicola bovis** Linn.).

Bruce carried out some preliminary tests with infested cattle, using 8% and 10% solutions of Volck. The solution was sprayed on the animals. His results showed that a 10% solution of Volck would kill the long-nosed ox louse and an 8% solution would kill the biting louse. There were no ill effects to the animals and the hair and skin were left in a fine condition.

Skoog sprayed two cattle heavily infested with lice, using a 5% solution of Volck. It gave an apparent 100% kill of **Bovicola bovis** but only a 50% kill of **Linognathus vituli.**

Caler treated a herd of 30 cattle infested with all three species of lice, using a 10% solution as a spray. About 1¼ quarts of solution were used per animal. Three days later it was estimated that a 95% control was secured on several of the larger animals and a 70% control on the other animals. This herd was later given a second treatment, using 2¼ quarts of 10% solution per animal and a 90% kill was obtained. Caler treated several other herds of range cattle and kills of 85-95% were obtained. He also treated a herd of dairy cattle, using two quarts of a 10% solution per animal applied as a spray. One day after treatment no live lice could be found. The success of this experiment is attributed partly to the fact that a nearly solid steam spray was used, whereas formerly a broad cone spray was used. The solid stream more successfully reached the skin where the lice were, while a fine spray was unable to penetrate the matted hair.

Caler carried out some experiments to determine the toxicity of Volck to adult lice. Two hundred adult biting lice (**Bovicola bovis**) were collected and one hundred of them dipped for twenty seconds in a 10% solution of Volck. The other 100 lice were dipped in distilled water for twenty seconds. The lice dipped in Volck evidently died very quickly, as most of them never moved at all after being taken from the dip. Within fifteen seconds after treatment all of the lice were dead, as shown by Table II.

TABLE II

Toxicity of Volck Special Emulsion No. 2 to Adult Lice

(Bovicola bovis) Time after treatment (divided into periods)	Minutes 0-15	Days 0-2	2-3	3-4	4-5	5-6	6-7
Number of lice (dipped in Volck) which died in each period (Total 100)	100						
Number of lice (dipped in water) which died in each period (Check of 100 lice)	0	0	90	6	3	0	1

One hundred long nosed ox lice **(L. vituli)** were treated as above and they proved to be much more resistant, as shown by comparing Table II with Table III.

TABLE III

Toxicity of Volck Special Emulsion No. 2 to Adult Lice

(L. vituli) Time after treatment (divided into periods)	Minutes 0-15	15-30	30-45	45-60	60-75	75-85	Days 0-2	2-3	3-4	4-5
Number of lice (dipped in Volck) which died in each period (Total 100)	5	15	18	9	2	1	All dead			
Number of lice (dipped in water) which died in each period (Total 100).	0	0	0	0	0	0	25	6	17	2

Caler also carried out some experiments with eggs of the cattle lice to determine the ovicidal action of Volck. He collected 100 eggs of the biting ox louse **(B. bovis)** dipped 50 of these in a 10% solution of Volck for one minute, and dipped the other 50 in distilled

water for one minute. After the treatment the eggs were placed on a blotter to remove the excess moisture, placed in the vials and put in a constant temperature incubator at 37.5 degrees C. None of the eggs treated with Volck hatched, but 76% of the check eggs hatched.

Flies
(**Musca domestica** L.; **Stomoxys calcitrans** L.; **Haemotobia serrata** R. Desv)

Caler sprayed cattle with a 10% Volck solution and found that it had no inherent repellent qualities against flies. He then combined many substances with Volck in an endeavor to find some combination which would make a very effective fly repellent.

The experimental fly repellent sprays were first applied with a compressed air sprayer and later with a fairly large hand sprayer. Check animals were used in each experiment, most of which were sprayed with tap. water. To check the results of each spray, either the number of flies on the animal or the number of times it switched its tail per unit of time was counted, or a combination of both methods was used. Unless otherwise stated, all applications were made between 3:00 p. m. and 5:00 p. m.

The formula used in preparing the spray was as follows:

1. Fish Oil
   1 part fish oil (by volume)
   10 parts 10% Volck (by volume)
   2 parts concentrated soap solution* (by volume)

This mixture was applied to cattle and the following results were obtained:

TABLE IV

Number of Times the Animals Switched Their Tails in Three-Minute Periods

Observation number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sprayed animal	5	4	5	5	6	5	6	8	6	5	6	12	8	10

*The "concentrated soap solution" used in these mixtures was made by cutting up laundry soap and dissolving it in hot water to saturation.

Check animal	56	50	57	54	59	50	55	54	61	57	55	47	54	57

Observations 1-11, inclusive, were made at ten-minute intervals, beginning fifteen minutes after spraying.

Observations 12-14, inclusive, were made at ten-minute intervals, beginning four hours after spraying.

The results given above are typical of several experiments with this mixture.

2. Oil of Tar

This was mixed with Volck and soap in the same proportions as the preceding, but was not at all satisfactory, due largely to the failure to get the oil of tar thoroughly emulsified.

Later some oil of tar was saponified with NaOH in an endeavor to get it in an emulsion with Volck. Although superior to untreated oil of tar, it was not at all satisfactory, either as a spray solution or as a repellent because it did not go readily into an emulsion and was irritating to the throat of the animals.

3. Amyl Acetate

1 part amyl acetate (by volume)
10 parts Volck Special Emulsion No. 2 (by volume)

This mixture was not effective as a repellent.

4. Asafetida

2 parts tincture of asafetida (by volume)
30 parts 10% Volck Special Emulsion No. 2 (by volume)

This made a very good emulsion and was fairly effective as a fly repellent, as shown by Table V.

TABLE V

Number of Times the Animals Switched Their Tails in Three-Minute Periods. Observations Taken at Ten-Minute Intervals.

Observation number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sprayed animals	5	2	2	6	6	3	4	9	11	11	14	44	47	30
Check animal	30	54	36	30	32	37	43	39	46	33	38	51	49	32

5. Naphthalene

25 parts alcoholic solution of naphthalene (by volume)

25 parts Volck Special Emulsion No. 2 (by volume)

25 parts carbon tetrachloride (by volume)

25 parts water (by volume)

This did not make a good emulsion and was so volatile that it retained its repellent qualities but a short time.

6. Pyrethrum extract

25 parts pyrethrum extract (by volume) Solvent probably kerosene

50 parts 10% Volck Special Emulsion No. 2 (by volume)

25 parts concentrated soap solution (by volume)

The results are shown in Table VI.

TABLE VI

Number of Times the Animals Switched Their Tails in Three-Minute Periods. Observations Taken in Ten-minute Intervals.

Observation number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Sprayed animal	2	4	4	2	3	6	4	6	8	10	10	12	11	12	14	32	34	37
Check animal	24	28	25	22	25	29	24	27	25	30	28	24	29	26	22	35	36	36

The above table does not bring out all the facts. For the first 45 minutes after spraying, the flies would not come anywhere near the animal and the tail switching was caused by mere force of habit. But after the first hour, the repelling action of the mixture rapidly decreased.

7. Pine Tar Oil

From the very first this repellent gave the best results. The first mixtures used were weak, but finally the following was made up and gave good results:

1 part pine tar oil (by volume)

10 parts 10% Volck Special Emulsion No. 2 (by

volume)

2 parts concentrated soap solution (by volume)

This was very effective, as shown by the following table:

TABLE VII

Number of Times the Animals Switched Their Tails in Three-Minute periods. Observations made at Ten-minute Intervals.

Observation number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sprayed animal	0	1	2	2	3	3	2	4	3	5	9	11	9	32	41	30
Check animal	28	32	27	40	42	55	48	52	34	28	64	56	44	27	35	33

Observations 1-13, inclusive, were made beginning 15 minutes after spraying.

Observations 11-13, inclusive, were made after the animals were turned outdoors.

Observations 14-16, inclusive, were made indoors and 16 hours after spraying.

In an endeavor to get the pine tar oil more thoroughly into emulsion, it was saponified with NaOH. This gave a good emulsion but subsequent experiments with it and with untreated pine tar oil proved that the untreated pine tar oil is a more effective repellent. The saponified pine tar oil is also irritating to the throat and nose of animals and man, causing severe coughing.

Experiments were also carried out to find if the addition of pyrethrum extract to the pine tar oil spray increased its efficiency. The tests proved that pyrethrum extract does not increase the repellent powers of the pine tar oil spray.

The mixture, to give the best results, was as follows:

1 part Volck Special Emulsion No. 2 (by volume)

2 parts pine tar oil (by volume)

1 part concentrated soap solution (by volume)

1 part water (by volume)

A typical table showing the results obtained with this spray is as follows:

TABLE VIII

Number of Flies on Animals. Observations Taken at One-half Hour Intervals.

Time after spraying in hours	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
Sprayed animal	0	0	0	0	2	3	2	6	8	9	7	9
Check animal	30	35	30	38	42	32	40	36	45	52	48	45

To determine the accumulative effect of the spray, the following experiment was carried out. An animal was sprayed twice a day for one week and once a day for the two succeeding weeks. The results of an observation 24 hours after spraying taken at the end of the first week were as follows:

Number of flies on animals. Results of six observations taken at ten-minute intervals **beginning 24 hours after spraying.**

Average number of flies on sprayed animal—21
Average number of flies on check animal—80

Number of times animals switched tails in three-minute periods. Six observations taken at ten-minute intervals, **beginning 24 hours after spraying.**

Average number of times sprayed animals switched tail—3
Average number of times check animal switched tail—27.5

It was also observed that the sprayed animal stood very quiet while the check animal was continuously making twitching movements of its skin, shaking its head, stamping its feet, and turning its head to lick the bite.

Results at the end of the second week, during which the animal was sprayed only once a day, were as follows:

Number of flies on animals. Results of six observations taken at ten-minute intervals beginning 24 hours after spraying.

Average number of flies on sprayed animal—15.3
Average number of flies on check animal—67.
Percentage reduction in number of flies —77.

During the third week of the experiment (second

week of spraying once a day), the results were much the same as those of the previous week.

The results of observations taken directly after spraying at the end of the last week are given in Table IX.

TABLE IX

Number of Flies on Animals. Observations Taken at One-half Hour Intervals, Beginning One-half Hour After Spraying.

Time after spraying in hours	½	1	1½	2	2½	3	3½	4	4½	5
Sprayed with Repellent	0	0	0	0	0	3	1	5	2	3
Check (sprayed with tap water)	75	70	86	78	68	75	82	74	72	66
Check*	0	0	0	3	1	5	9	7	11	14

Effects of This Spray on the Animals

During the first week of the above experiment, the animals were sprayed at about 8:30 a. m. and 4:30 p. m. Directly following these sprayings, the animals were turned out of doors. Although often the sunlight was very strong and the temperature high, no harmful results could be found.

The spray gives a yellowish tinge to white hair, but imparts a lustre to it which is characteristic of Volck. The lustre is especially noticeable on animals with dark hair.

Some pine tar oil miscible in water was also procured by Caler. This was received too late to carry out conclusive experiments, but the "Pineole Soluble Disinfectant" gave promise of being an effective repellent

*An animal never before sprayed with a repellent was sprayed to use as a check against the animal which had been sprayed for three weeks.

in combination with Volck.

EXTERNAL PARASITES OF HORSES

Eggs of Horse Bot Fly (**Gastrophilus intestinatis** DeGeer)

Bruce applied undiluted Volck with a rag to the eggs of bot flies on the legs of two horses. Immediately after application, some hair with eggs attached was clipped off from treated and untreated areas and placed in open dishes.

Six days later the eggs were hatched with a needle and the viability determined. The results showed that, of the treated eggs, 117 were dead and 13 alive; of the untreated eggs, four were dead and 101 alive. In another test, 119 treated eggs were dead and nine alive, and 160 untreated eggs alive and 34 dead.

Lice

Biting Louse of Horse (**Trichodectes equi** L.)

Hall applied a 6% Volck solution as a spray to a horse infested with lice. All the nymphal and adult lice were killed. The animal later became reinfested from eggs which were not killed.

Skoog failed to get any control of lice on a horse with a 5% Volck solution, but with a 10% solution he states that he secured an apparent 100% kill, as no nymphal or adult lice could be found for six days after treatment.

Caler treated two horses which had been out on the range all winter and were heavily infested with biting lice. The infestation was about 15 lice per square inch. These animals were sprayed with a 10% solution of Volck and the solution was rubbed in with brushes. Eight quarts of the solution were used per animal. Four days later the animals were examined and no lice could be found on one animal but a few lice were found on the other. At least a 95% control was secured on this second animal. The hair of both animals appeared much better after treatment. It was smooth and soft where before it had been rough and harsh. The animals were in the barn during the treatment and for 1½ days afterward.

EXTERNAL PARASITES OF ASSES

Biting and Sucking Lice of Horses

(**Haematopinus asini** L., **T. pilosis** Giebel)

Bruce obtained a jack which was heavily infested

with **H. asini** and **T. parumpilosis** Piaget. The infestation was estimated at twenty lice per square inch. The hair was very long, so one side was clipped to offer a means of comparison as to penetration of the Volck solution. A 10% Volck solution was sprayed on the animal and worked in with the fingers and a stiff brush, the clipped area requiring less material and labor.

About one hour after treatment, 150 lice were counted out and all found to be dead. Careful examinations over three days failed to reveal any live lice.

A jennet and her half-grown colt were also heavily infested and were sprayed with an 8% solution of Volck, the material being thoroughly worked into the hair. A 100% kill was obtained.

EXTERNAL PARASITES OF HUMANS

Lice

Head Lice of Man (**Pediculus humanis** Linn.)

Four children infested with head lice were treated by Bruce. He washed the heads of the children with a 10% solution of ordinary Volck. One day later, two of the children were found free of lice, while the other two had four and six lice respectively. It was found, however, that the infested children had washed their heads soon after the Volck was applied. The application of Volck had no harmful effects upon the skin or hair.

Common Chiggers, or Harvest Mites.

Caler treated chigger bites on himself and other students with various concentrations of Volck. A 20% solution was applied to some affected areas on one student, and some other affected areas left as checks. The student reported immediate and permanent relief from the irritation where the Volck had been applied, but the untreated areas continue to irritate. Another student used 100% Volck and got relief from chigger bites but failed to keep any areas as checks. Caler used 100% Volck on chigger bites which were in a more advanced stage and found that the treated bites persisted as long as the untreated, but were not so irritating.

Later an infestation of chiggers was obtained by Caler and noticed at an early stage. One leg was bathed in a 20% Volck solution and the other in warm water. The check leg itched very much during the following night, but the treated leg did not bother at all or at any

time after. The next day, certain affected spots on the check leg were treated with 100% Volck. This acted as a palliative, but did not entirely stop the itching.

EXTERNAL PARASITES OF REPTILES

Mites

Ophionyssus serpentium (Hirst)

Skoog treated eight varieties of live museum snakes (one of each variety), infested with mites, with a 10% Volck solution at 65 degrees F. The snakes were immersed in the solution for one minute. The other varieties were retained as controls. The cages were sprayed with a 10% solution. No mites could be found on or around the treated snakes over a period of ten days following treatment. A month following treatment there was a slight infestation. Later experiments by Skoog showed that a 5% solution would not give control.

INCIDENTAL OBSERVATIONS

Toxicity of Volck Oil to Dipterous Larvae

The purpose of these observations was to determine whether a solution of Volck might kill screw worms in wounds. These larvae not being available, closely related dipterous larvae were used for experimentation.

Caler collected dipterous larvae from damp straw and treated them with Volck oil at concentrations ranging from 5% to 50%. The larvae were immersed in the Volck oil about 15 seconds and then placed in salve boxes. Check larvae were used for each concentration and were dipped in distilled water. Four hours after treatment, no larvae were dead. At this time several larvae were placed in a salve box with a little straw. The larvae and straw were soaked in 50% Volck and enough added to that the bottom of the box was covered.

The next morning none of the larvae was dead, but four of the treated larvae had pupated. The larvae placed in the can with the 50% Volck had a complete coating of oil around them, but were not affected. Fifty hours after treating, eight of the treated larvae had pupated and only two had died. One check larva had died also.

Volck Oil as a Hair Dressing

Bruce used 50 % Volck as a hair dressing, applying it about twice a week for three months, and stated that it was very satisfactory. Hall used 100% Volck as a

hair dressing for nine months and found it very satisfactory. Two other men used 50% Volck to which a few drops of perfume were added and found it wholly satisfactory as a hair dressing.

Hall states that Volck oil in a 50% solution was brushed into the hair of 20 steers and one heifer which were being conditioned for the show ring. It gave a smooth and shining coat of hair to the animals.

CONCLUSIONS

The results of four years' research work at the Kansas Agricultural Experiment Station with Volck Special Emulsion No. 2 as a control for external parasites are presented.

1. A 7% solution applied as a dip and thoroughly worked into the feathers was an effective control for the common lice on poultry.

2. A 50% solution applied as a spray controlled the common poultry mite in an old poultry house.

3. A 10% solution applied as a spray and thoroughly worked into the hair, controlled both the biting and sucking lice on cattle.

4. A 10% solution thoroughly applied as a spray, dip, or wash, to dogs and cats eliminated all fleas from the animals but did not prevent reinfestation in a few days. It was found that the animal should be bathed in soap and water one day after treatment to remove the excess oil.

5. A 10% solution killed all the lice on three donkeys when applied as a spray and worked in.

6. Volck applied alone did not control mange mites.

7. A 50% solution did not control ox-warbles when injected into the cysts.

8. A 10% solution when applied as a spray controlled the sucking lice on hogs.

9. A mixture of one part Volck Special Emulsion No. 2, two parts pine tar oil, one part concentrated soap solution in water, and one part water, was an effective repellent spray for flies on cattle (**Musca domestica, Stomoxys calcitrans,** and **Haematobia serrata**).

10. Undiluted Volck Special Emulsion No. 2 was an efficient ovicide when applied to eggs of the horse bot fly.

11. A 10% solution was an effective control for biting and sucking lice on horses.

12. A 10% solution applied as a dip controlled the

mites on snakes in the museum.

13. Solutions as high as 50% was apparently not toxic to dipterous larvae.

14. Volck Special Emulsion No. 2, when taken internally by animals in such concentrations and amounts as might be expected when being treated with Volck, was not harmful to them.

15. An 8% solution eliminated all the mites (**Liponyssus**) from two birds.

16. Volck Special Emulsion No. 2 apparently had some value as a treatment for chiggers on man. It acted as a palliative but did not wholly stop the itching.

17. Volck Special Emulsion No. 2 was non-irritating to the skin of animals or delicate tissues such as the eyes.

REFERENCES

(1) Bruce, W. G. 1928. The Use of Volck Against External Parasites of Domestic Animals. Jour. Kans. Ent. Soc. 1:74-79.

(2) Hall, D. G. 1929. Volck Oil, Special Emulsion Number Two, as an Animal Insecticide. Jour Kans. Ent. Soc. 2:74-82.

(3) Skoog, H. E. 1930. The Use of Volck Oil, Special Emulsion Number Two, in the Control of External Parasites of Animals. (Unpublished report).

MINUTES OF SEVENTH ANNUAL MEETING OF THE KANSAS ENTOMOLOGICAL SOCIETY

President Geo. A. Dean called the annual meeting of the Society to order April 25, 1931 at 10:10 a. m. in room 417 of Snow Hall at Kansas University.

The minutes of the sixth annual meeting were read by the secretary. Motion was made that the minutes, as read, be accepted. Motion carried.

The Treasurer made a report of the business in regard to the publication of Volume III of the Journal of the Kansas Entomological Society. Motion made to accept the report. Motion carried.

A report was made by the Treasurer of the savings and checking account of the society. Motion made that report be accepted. Motion carried.

The Secretary-treasurer made a report on the subscription lists of Volumes III and IV of the Journal of the Kansas Entomological Society. W. Knaus made a statement in regard to the publication of each number of the Journal. In addition to the 225 copies printed and stapled there are 30-35 extra copies printed which are unbound.

The Publication and Wild Life committees reported progress.

President Dean appointed the following committees:

Nomination: R. L. Parker, P. A. Readio, Kathleen Doering

Resolutions: D. A. Wilbur, R. H. Beamer, H. R. Bryson

Membership: H. B. Hungerford
Roger C. Smith
P. M. Gilmer

New Business

The Journal of the Kansas Entomological Society reprint prices were discussed and compared with other similar publications. Motion made that the matter of reprint prices be left with publication committee and the Secretary-treasurer as ex-officio member. Motion carried.

W. Knaus stated that the Kansas Academy of Science has set the place of its next meeting to be at McPherson College.

W. Knaus suggested to the publication committee that a half-tone of Dr. F. H. Snow be run for the next two years and that half-tones shall be run for two years to save expenses.

Dr. H. B. Hungerford made the motion that the half-tone of Dr. F. H. Snow be run on the cover of the Journal for the next two volumes, (V) 1932 and (VI) 1933. Motion carried.

Dr. H. B. Hungerford suggested that if possible the papers be carried over to the afternoon meeting since this is the program as printed in the announcements of the meeting.

Motion made to meet at 1:00 p. m. Motion carried.

Motion made at 11:00 a. m. to adjourn until 1:00 p. m.

President Dean called the meeting to order at 1:20 p. m. for the presentation of the following papers and reports:

1. W. Knaus reported upon the preparation of his collection of Coleoptera for shipment to the museum at K. S. C. He has 75,000 specimens and 10,000 species which are indigenous to North America.
2. H. B. Hungerford reported upon his comparison of **Hydrometra** (Hydrometridae-Hemipera) species types in European Museums.
3. A record of a new family of insects (Dixidae) for Kansas—R. H. Painter.
4. Recent work with Haitian Neuroptera and Canadian Chrysopidae—Roger C. Smith.
5. The Chinch Bug as a Rice Pest—Dwight Isely.
6. The biology of **Mesovelia douglasensis** Hung. (Mesoveliidae-Hemiptera)—C. H. Hoffman.
7. Resistance of Sorghum Varieties to Chinch Bug Injury—R. O. Snelling.
8. Mill Fumigation with a new form of Hydrocyanic Acid Gas (discoids)—Geo. B. Wagner.
9. Notes in regard to the arbor-vitae aphis, **Dilachmus tujafilinus** Del Guer.—R. L. Parker.
10. Collecting trip in Florida. 1930—R. H. Beamer.
11. Tree Distribution of the Codling Moth—P. M. Gilmer.

Final Business

Reports of Special Committees:

Committee on check list—To a certain extent the Journal of the Kansas Entomological Society takes the place of this committee and the list is gradually making progress. There was much discussion of the usefulness of a check list. Motion was made that the editor of the Journal of the Kansas Entomological Society write to Morgan Hebard of Philadelphia, Pennsylvania suggesting that he prepare a key to the Kansas Orthoptera. Motion carried.

Nominations committee made the following nominations for officers of the society: President, R. H. Beamer; Vice-President, P. M. Gilmer; Secretary-Treasurer, R. L. Parker.

The following nominations for the publication committee were made by the above committee: P. B. Lawson, Editor, Kansas University, Lawrence, Ks.; Roger C. Smith, Kansas State College, Manhattan, Ks.; W. Knaus, McPherson, Kansas; Dwight Isely, University of Arkansas, Fayettville, Ark.; R. H. Painter, Kansas State College, Manhattan, Kansas.

Motion was made that the secretary cast the necessary ballots in favor of the members so nominated for officers and publication committee for the ensuing year. Motion carried and the members were so voted into office in their respective positions.

Resolutions committee made the following resolutions:

Resolved: that the Kansas Entomological Society express to the members of the Kansas Entomological Department of the University of Kansas its appreciation for the courteous and instructive manner in which they have so unselfishly extended themselves to make this meeting of the Society both pleasant and educational.

Be it further Resolved: that the Society express its recognition of and appreciation for the excellent service rendered by Dr. Paul B. Lawson, editor, Dr. Warren Knaus, publisher, Dr. R. L. Parker secretary-treasurer and all others responsible for establishing and maintaining the present high quality of the Journal of the Kansas Entomological Society.

1. Motion made that the resolutions be approved. Motion carried.
2. Membership committee made no report. This committee was urged to increase the membership of the society.
3. Motion made that the time and place of the next annual meeting be left with the executive committee. Motion carried.

Members and friends in attendance numbered 57 who were from Lawrence, McPherson, Baxter Springs, Manhattan, Wichita, Ottawa, Clay Center and Baldwin, Kansas, and Fayetteville, Arkansas, and Port-au-Prince, Haiti.

Motion made that the society adjourn until the next annual meetting. Motion carried.

Adjourned at 4:40 p. m.

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JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

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President R. H. Beamer, State University, Lawrence.
Vice President P. M. Gilmer, Wichita.
Ses.-Treas. R. L. Parker, Kansas State College, Manhattan.

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Kansas Entomological Society

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
ROGER C. SMITH, Manhattan R. H. PAINTER, Manhattan
W. KNAUS, McPherson DWIGHT ISLEY, Fayetteville, Ark.

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ERRATA

Page 26. Line 8—"Iotus" should read "Lotus".

Page 35. Third line from bottom—"rosac" should read "rosae".

Page 39. Author's name should read "Howard E. Dorst".

Page 53. Map upside down.

Page 54. Line 29 — "septemdecim" should be "septendecim".

Page 58. Line 10—Same change.

Page 99. Fourth line from bottom—"Dilachmus" should be "Dilachnus".